

What is claimed is;

1. A motor control apparatus that drives a 3-phase synchronous motor by applying a 3-phase rectangular wave voltage to the 3-phase synchronous motor, comprising:

5 a current detection device that detects a current flowing to the synchronous motor;

a current conversion device that converts through a coordinate conversion the current detected by the current detection device to a d-axis current and a q-axis current in 10 a dq-axis coordinate system which rotates in synchronization with rotation of the motor;

a phase calculation device that calculates a phase of the rectangular wave voltage based upon a q-axis current deviation between a q-axis current command value and the q-axis 15 current; and

a power conversion device that generates the rectangular wave voltage having the phase calculated by the phase calculation device from a DC source.

20 2. A motor control apparatus according to claim 1, wherein:

the phase calculation device calculates the phase of the rectangular wave voltage by executing PI control or PID control so as to reduce the q-axis current deviation to 0.

25 3. A motor control apparatus according to claim 2, further

comprising:

16 a speed detection device that detects a rotational speed  
of the motor; and

17 a phase compensating device that compensates the phase  
5 of the rectangular wave voltage based upon the q-axis current  
command value, a voltage of the DC source at the power conversion  
device and the rotational speed of the motor.

22 4. A motor control apparatus according to claim 1, wherein:

23 10 the phase calculation device calculates a q-axis voltage  
command value by executing PI control or PID control so as  
to reduce the q-axis current deviation to 0 and calculates  
the phase based upon the q-axis voltage command value and a  
voltage of the DC source at the power conversion device.

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29 5. A motor control apparatus according to claim 4, further  
comprising:

30 a speed detection device that detects a rotational speed  
of the motor; and

31 a voltage compensating device that compensates the q-axis  
voltage command value based upon the q-axis current command  
value, the voltage of the DC source at the power conversion  
device and the rotational speed of the motor.

36 25 6. A motor control apparatus according to claim 1, wherein:

the phase calculation device includes a device that calculates a d-axis current command value by executing PI control or PID control so as to reduce the q-axis current deviation to 0, a device that calculates a d-axis voltage command value based upon the d-axis current command value and the d-axis current and a device that calculates the phase of the rectangular wave voltage based upon the d-axis voltage command value and a voltage of the DC source at the power conversion device.

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7. A motor control apparatus according to claim 6, further comprising:

a speed detection device that detects a rotational speed of the motor; and

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a current compensating device that compensates the d-axis current command value based upon the q-axis current command value, the voltage of the DC source at the power conversion device and the rotational speed of the motor.

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8. A motor control apparatus according to claim 6, further comprising:

a speed detection device that detects a rotational speed of the motor; and

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a voltage compensating device that compensates the d-axis voltage command value based upon the q-axis current

command value and the rotational speed of the motor.

9. A motor control apparatus that drives a 3-phase synchronous motor by applying a 3-phase rectangular wave 5 voltage to the 3-phase synchronous motor, comprising:

a current detection means for detecting a current flowing to the synchronous motor;

10 a current conversion means for converting through a coordinate conversion the current detected by the current detection means to a d-axis current and a q-axis current in a dq-axis coordinate system which rotates in synchronization with rotation of the motor;

15 a phase calculation means for calculating a phase of the rectangular wave voltage based upon a q-axis current deviation between a q-axis current command value and the q-axis current; and

a power conversion means for generating the rectangular wave voltage having the phase calculated by the phase calculation means from a DC source.

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10. A motor control method for driving a 3-phase synchronous motor by applying a 3-phase rectangular wave voltage, comprising:

25 detecting a current flowing to the synchronous motor; converting through a coordinate conversion the detected

current to a d-axis current and a q-axis current in a dq-axis coordinate system which rotates in synchronization with rotation of the motor;

calculating a phase of the rectangular wave voltage based  
5 upon a q-axis current deviation between the q-axis current resulting from the coordinate conversion and a q-axis current command value; and

generating the rectangular wave voltage having the phase having been calculated from a DC source.